WHAT IS CLAIMED IS:

1. A device, comprising:

a first electrode;

a second electrode;

a photoactive region disposed between the first electrode and the second electrode, the photoactive region further comprising:

a first organic layer comprising a mixture of an organic acceptor material and an organic donor material, wherein the first organic layer has a thickness not greater than 0.8 characteristic transport lengths; and

a second organic layer in direct contact with the first organic layer, wherein:

the second organic layer comprises an unmixed layer of the organic acceptor material or the organic donor material of the first organic layer, and

the second organic layer has a thickness not less than about 0.1 optical absorption lengths.

2. The device of claim 1, wherein the first organic layer has a thickness not greater than 0.3 characteristic transport lengths.

3. The device of claim 1, wherein the device has a power efficiency of 2% or greater.

4. The device of claim 1, wherein the device has a power efficiency of 5% or greater.

5. The device of claim 1, wherein the second organic layer has a thickness not less than about 0.2 optical absorption lengths.

6. The device of claim 1, wherein the mixture of the organic acceptor material and the organic donor material in first organic layer occurs in a ratio ranging from about 10:1 to about 1:10, respectively.

7. The device of claim 1, wherein each of the first and second organic layers contributes at least about 5 percent of the total energy output of the photoactive device.

8. The device of claim 7, wherein each of the first and second organic layers contributes at least about 10 percent of the total energy output of the photoactive device.

9. The device of claim 1, wherein each of the first and second organic layers absorbs at least about 5 percent of the energy absorbed by the photoactive region.

10. The device of claim 9, wherein each of the first and second organic layers absorbs at least about 10 percent of the energy absorbed by the photoactive region.

11. The device of claim 1, wherein the organic acceptor material is selected from a group consisting of: fullerenes; perylenes; catacondensed conjugated molecular systems such as linear polyacenes (including anthracene, napthalene, tetracene, and pentacene), pyrene, coronene, and functionalized variants thereof.

12. The device of claim 1, wherein the organic donor material is selected from a group consisting of: metal containing porphyrins, metal-free porphyrins, rubrene, metal containing phthalocyanines, metal-free phthalocyanines, diamines (such as NPD), and functionalized variants thereof, including naphthalocyanines.

13. The device of claim 1, wherein the first organic layer consists essentially of a mixture of CuPc and C_{60}.

14. The device of claim 1, further comprising a first non-photoactive layer disposed between the first electrode and the second organic layer.

15. The device of claim 14, wherein the first non-photoactive layer comprises 2,9-dimethyl-,7-diphenyl-1,10-phenanthrolin (BCP).

16. The device of claim 14, wherein the first non-photoactive layer is an exciton blocking layer.

17. The device of claim 1, wherein the first electrode is comprised of indium tin oxide.

18. The device of claim 1, wherein the second electrode is comprised of Ag.

19. The device of claim 1, wherein the second organic layer comprises the organic acceptor material of the first organic layer.

20. The device of claim 1, wherein the second organic layer comprises the organic donor material of the first organic layer.

21. The device of claim 1, wherein the device is a tandem solar cell.

22. The device of claim 1, wherein the device is a solar cell.

23. The device of claim 1, wherein the device is a photodetector.

24. A device, comprising:

a first electrode;

a second electrode;

a photoactive region disposed between the first electrode and the second electrode, the photoactive region further comprising:

a first organic layer comprising a mixture of an organic acceptor material and an organic donor material wherein the first organic layer has a thickness not greater than 0.8 characteristic transport lengths;

a second organic layer in direct contact with the first organic layer, wherein:

the second organic layer comprises an unmixed layer of the organic acceptor material of the first organic layer, and

the second organic layer has a thickness not less than about 0.1 absorption lengths; and

a third organic layer disposed between the first electrode and the second electrode, the third organic layer being in direct contact with the first organic layer, wherein:

the third organic layer comprises an unmixed layer of the organic donor material of the first organic layer, and

the third organic layer has a thickness not less than about 0.1 optical

absorption lengths.

25. The device of claim 24, wherein the first organic layer has a thickness not greater than 0.3 characteristic transport lengths.

26. The device of claim 24, wherein the device has a power efficiency of 2% or greater.

27. The device of claim 24, wherein the device has a power efficiency of 5% or greater.

28. The device of claim 24, wherein the second organic layer has a thickness not less than about 0.2 optical absorption lengths.

29. An solar cell, comprising:

a first electrode;

a second electrode; and

an organic photoactive region disposed between the first and second electrodes, wherein the photoactive region is comprised of a mixture of two organic materials, and wherein the series resistance between the first and second electrodes is in the range of about $0.25\Omega\ cm^2 \pm 0.15\Omega\ cm^2$.

30. A device, comprising:

a first electrode;

a second electrode;

an first organic layer disposed between the first and second electrodes, wherein the first organic layer comprises a mixture of an organic acceptor material and an organic donor material; and

a second organic layer disposed between the first electrode and the second electrode, wherein:

the second organic layer comprises an unmixed layer of the organic acceptor material or the organic donor material of the first organic layer, and

the device is a solar cell, and photons absorbed by the first organic layer contribute at least 5 percent of the photocurrent generated by the device, and photons absorbed by the second organic layer contribute at least 5 percent of the

photocurrent generated by the device.

31. The device of claim 35, wherein photons absorbed by the first organic layer contribute at least 10 percent of the photocurrent generated by the device, and photons absorbed by the second organic layer contribute at least 10 percent of the photocurrent generated by the device.